

ANALYTICAL STUDY OF 100 CASES OF FACIOMAXILLARY INJURIES

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CERTIFICATE

I, hereby certify that this dissertation entitled “**ANALYTICAL STUDY OF 100 CASES OF FACIOMAXILLARY INJURIES**” is a bonafide work conducted by **Dr. A.P.Selvam** under my full supervision and guidance and submitted in partial fulfillment of the requirements in the award of the degree of **MASTER OF CHIRURGIE IN PLASTIC SURGERY** for the February 2006 examination under **THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY, CHENNAI.**

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INTRODUCTION

Plastic surgeons are one of the corner stones of the Treatment Team for facio maxillary injuries. With recent profound increase in the number of high speed motor vehicles disproportionate to the road structures & lack of road safety precaution and inadequately followed traffic rules there is an increase in the rates of Road Traffic Accidents (RTA).

This study is planned to analyse facio maxillary injuries in our hospital.

AIM OF THE STUDY

In our hospital, We, Plastic Surgeons with the services and excellent inter departmental interactions of the other specialists for trauma care viz., General surgeon, Orthopedic surgeon, Anaesthetist, Cardiothoracic surgeon, Neuro surgeon, Paediatric surgeon, Vascular surgeon, Dental surgeon, and Urogenital surgeon available round a clock are able to provide primary care.

This study is aimed to analyse the faciomaxillary injuries of our hospital in terms of mode of injury, age group, types of injury, anatomical structure, prevalence of the major injuries and their management.

To compare the efficacy of various mode of managements for an injury.

To followup the cases and the outcome of our management.

To assess the role of systemic diseases in the wound healing of facial injuries.

MATERIALS AND METHODS

Government Rajaji Hospital is a tertiary care centre, where all general surgical and allied higher surgical specialities are available under one roof. It is a referral centre in the southern part of Tamilnadu. Well equipped both by manpower and infrastructures, the Trauma ward and the Head injury ward cater all the referred patients to our hospital. This study was done on continuous 100 patients of the faciomaxillary injuries and analysed the mode, pattern, distribution of injuries during January 2005 to July 2005.

All the patients were treated as per the basic principles of Facio Maxillary injuries management with consideration of the functional and aesthetic results.

All the relevant higher speciality consultants were included in the treatment plan for each patient who had multiple other injuries. All the minor and major surgical procedures were done in the emergency Trauma OT. Post operatively these patients were transferred to plastic surgery ward and managed.

When the patients were fit, they were discharged and followed up in out patient clinic regularly. Almost all the patients were followed up regularly and the functional, aesthetic results were assessed. If necessary secondary procedures were done.

PRINCIPLES OF MANAGEMENT OF FACIOMAXILLARY INJURIES

Facial injuries deserve special attention because of their **enormous functional and**

aesthetic significance. The principles which have resulted in improved functional and aesthetic results are

1. Precise anatomic diagnosis
2. Early one stage repair
3. Direct fracture exposure
4. Precise anatomic rigid fixation
5. Primary bone grafting
6. Definitive soft tissue management

Initial care of the patients as per ATLS guidelines

1. Airway is ensured
2. Haemorrhage controlled
3. Shock treated
4. Associated injuries evaluated. Then only the facial injuries diagnosed and treated.

1. PRECISE ANATOMIC DIAGNOSIS

Precise anatomical diagnosis is done on the basis of history, physical examination and radiological investigations.

- **History**
 - History of previous congenital or acquired facial deformity
 - Presence of previous occlusion problems
- **Examination**
 - Facial wounds

- Eye-vision, pupillary reflexes, eyeball movements, fundus examination, eye lid movements especially LPS action.
- Brain – Head injury
- CSF rhinorhea or otorrhoea (skull base fracture)
- Injury to lacrimal system
- Larynogoatracheal injury (subcutaneous emphysema, hoarseness of stridor)
- Cervical spine injury
- Systematic examination of facial fracture (From superior to inferior and from lateral to medial)
- Occlusion

- **Radiographic studies**

- Plain X- rays to confirm facial bone fractures and cervical spine injury.
- Orthopantomogram
- CT Scan (preferred in presence for cervical spine injury. Difficult positions for plain X- rays may prove dangerous in cases of cervical spine injury).
- Three dimensional CT scan
- MRI

2. EARLY STAGE REPAIR

If prolonged anaesthesia is not contraindicated due to multisystem injuries or general condition of the patient, an early one- stage definitive repair should be the goal.

3. DIRECT FRACTURE SITE EXPOSURE

Entire craniofacial skeleton are exposed by either one of the following incisions:

- a) The bicoronal incision (for cranium, nasoethmoid area, orbit and zygomatic arch)
- b) The subciliary incision (for inferior orbital rim, floor of the orbit, anterior zygoma and maxilla)
- c) The upper gingivobuccal incision (for maxilla)
- d) The lower gingivobuccal incision (for mandible)
- e) Submandibular incision for complex mandibular fractures and condyle neck fracture

4. REDUCTION AND PRECISE ANATOMIC RIGID FIXATION

Stabilization and fixation of craniofacial skeleton is done in the following order

- a) Stabilization of mandibular (lower face) to re-establish the patients' posterior vertical height and lower transverse facial width
- b) Reconstruction of horizontal and vertical height and lower transverse facial with zygomatic arch. From lateral to medial, the unstable bone is fixed to stable bone

a. Stabilization and fixation of lower face

Rigid internal fixation of maxillary and mandibular segments was done with intermaxillary fixation in the patient's pretraumatic occlusal relationship.

b. Reconstructions of horizontal and vertical facial buttresses

After the lower face is stabilised, horizontal and vertical facial buttresses are reconstituted. By transcoronal incision, microplates compression plates or lag screws.

5. PRIMARY BONE GRAFTING

To replace missing bone and to correct defects bone grafts are used. Bone is harvested from calvarium, iliac crest or ribs. Whenever possible bone is fixed with miniplates or lag screws to reduce the chances of absorption.

6. DEFINITIVE SOFT TISSUE MANAGEMENT

- Wound debridement is minimal over the face owing to its good vascularity. Soft tissues are covered by vascularized tissue.
- To prevent soft tissue ptosis after subperiosteal dissection to expose fracture site, soft tissue periosteum is fixed to the remaining periosteum or reconstruction plates or holes drilled in bone.

Individual structures are repaired as follows.

1. SOFT TISSUE

Contusion : Contusion is a bruising injury caused by blunt trauma. Small haematomas are left for spontaneous resorption. Haematomas in the “Current jelly” stage are evacuated by

incision. Few are aspirated with large bore 18G needle.

Abrasion : Abrasion are treated with cleaning with non irritating soap, antibiotics and saline dressing. Sun screen cream is prescribed for 6 months at the time of discharge.

Laceration : Wound toileting is done as soon as patient is received (cleaned, irrigated and debridement). Ragged, tangential, severely contused wound edges are excised till there is marginal dermal bleeding to provide perpendicular skin edges that will heal primarily with a minimum of scar.

Closely parallel lacerations are converted to a single wound by excising the intervening skin bridge thus minimising scar formation. Displaced tissues are returned to normal anatomical position.

Suturing : Polyglactin (Vicryl) are used for cosure of muscular and subcutaneous tissue to minimize dead space and the accumulation of blood and serum. Interrupted sutures of 4-0 or 5-0 polypropylene are used for skin closure.

Suture removal: Eyelids sutures removed in 3-4 days. Other parts of face in 4-6 days.
Ear (Cartilage) injury 10-14days

2. FOREHEAD AND BROW

The scars are preferably placed in or parallel to normal skin lines.

Fracture of supra orbital ridge & frontal sinuses are ruled out.

Muscle underneath the brow was repaired to prevent spreading and depression of the scar with polyglactin (Vicryl) sutures 4/0.

3.EYELIDS

Eyelid wounds are classified into

a. Superficial laceration

1. That parallel to lid margin.
2. That perpendicular lid margin.

Laceration that are perpendicular to the lid margin cross normal skinlines and tend to gape are sutured first. The underlying muscle and subcutaneous tissues are sutured prior to the skin closure.

Conjunctival laceration is repaired with 6/0 catgut. Lid margin is sutured with 3 suture technique with 6/0 catgut.

b. Deep laceration

Division of the LPS, aponeurosis superior rectus muscle are repaired. Tarsus and ciliary margin are approximated accurately. Once these structures have been sutured the remainder of the eyelid falls into place.

Since any delay in eyelid reconstruction, orbicular muscles may undergo fibrosis, the tarsal plate thickens and retracts and wound edges can no longer be approximated. Primary reconstruction should be done as early as possible.

The integrity of the lacrimal apparatus and canthal ligaments are preserved. Divided and grossly displaced lacrimal system are cannulated with 3/0 polypropylene which acts as an excellent probe and splint for the lacrimal duct. Incomplete injury the lacrimal system are simply approximated. Injury to the upper canaliculus alone is left unrepaired because rarely it results in epiphora.

4. EAR

Upper 1/3 defect

1. Antia's chondrocutaneous helical advancement.
2. Pre auricular flaps.
3. Banner flap from auriculo cephalic sulcus.

Middle 1/3 defect

1. Converse tunnel procedure
2. Composite graft from the opposite side
3. Wedge resection with accessory triangles.
4. Helical advancement.

Lower 1/3

1. Post auricular flap
2. Preau technique of bilobed flap

5. LIP

Upto 1/4 of the lip loss

Primary Closure

Defects of 1/4 – 1/2 of the lip

1. Abbe flap
2. Abbe Estlander flap
3. Nasolabial flap

Defects more than 1/2 of the lip

Upper lip

1. Karapandzic flap

2. Cheek advancement

3. Fan Flap

Lower lip

1. Fan flap

2. Karapandzic flap

3. Webster cheek advancement

4. Bilateral naso labial flap

6. NOSE

Aesthetic units of the nose (Alar lobule, Soft triangle, Tip and Dorsum) are considered in nose reconstruction.

Local flaps

Defect ≤ 1.2 cm - Banner flap

1.3 - 1.9 cm - Bilobed flap

≤ 2 cm - Dorsal nasal flap

Cheek flaps

Cheek advancement

Nasolabial transposition

Subcutaneous pedicle flap

Paramedian forehead flap

Gullwing flap

Scalping flap

Lining Techniques

Turnin nasal flap

Infolded extra nasal flap

Skin grafts of the undersurface of forehead flap

Composite flaps of nasal septum

Lining advancement procedures.

7. FRACTURES OF MANDIBLE

Symptoms

Pain, swelling, malocclusion and dysphagia.

Signs

Swelling, step deformity of lower mandibular border, tenderness, crepitation, malocclusion, sublingual haematoma

Investigations

Plain X-ray mandible – PA view

- Plain X-ray mandible - 30° oblique
- Orthopantomogram
- Linear tomography of temporomandibular joint

Applied Anatomy

- Segmental fractures (Fractures at two places) of the mandibular body may be displaced medially by pull from the mylohyoid muscle.
- In bilateral parasymphiseal fractures, the anterior fractured segment of the mandible is displaced posteriorly due to pull from genihyoid and digastric muscles. This may lead to tongue fall posteriorly and respiratory obstruction.
- In subcondylar fracture, the condyle tends to be displaced medially and anteriorly

due to pull from the lateral pterygoid muscle.

- Fractured tip of the coronoid process is pulled upwards towards the infratemporal fossa by the temporalis muscle.

Classification

1. Based on direction and level of fracture line

- Vertically favorable fractures - Fracture line runs downwards and forwards. The posterior segment is pulled upwards by masseter, temporalis and medial pterygoid (elevators of mandible). The anterior segment is pulled downward by the digastric and geniohyoid muscle (depressor - retractors of mandible). Thus the fracture is maintained in reduced position.
- Vertically unfavourable fractures - Fracture line runs downward and backward. The elevators and depressors displace the fracture.
- Horizontally favourable fractures - Fracture line runs anteriorly from lateral cortex of mandible towards medial cortex.
- Horizontally unfavourable fracture – fracture line runs posteriorly from the lateral cortex of mandible towards medial cortex.

2. Based on the presence or absence of teeth on the fracture segments

- Class - I : Teeth present on both sides of fracture line
- Class – II: Teeth present on only one side of fracture line
- Class – III:Fracture in edentulous area

Principles of Treatment

▪ Reduction

Fracture is reduced to achieve the normal occlusion, facial symmetry and

balance. Teeth extraction in the fracture line unfavourably influences the fracture stabilization. Tooth should be stabilized early after irrigating the socket. The tooth is extracted if it prevents reduction, has fractured root, extensive periodontal damage or significant dental caries. Avulsed teeth should be reimplanted, preferably within an one-half to one hour, and firmly fixed.

▪ **Fixation**

1. Fixation applied to teeth:

a) interdental fixation

b) Intermaxillary fixation

- Direct wiring
- Eyelet wiring
- Arch bars

c) Dental splints

2. Direct fixation of bone (Internal fixation):

a) Interosseous wiring

b) Metal plate and screw fixation

c) Lag screw fixation

d) Resorbable plates & screws

3. Combination of 1 and 2:

Interdental fixation

Fractures of alveolar process with secure teeth are fixed by arch bar fixation after reduction. If required Intermaxillary fixation can be done in these cases.

Direct dental wiring for Intermaxillary fixation

Stainless steel wire is twisted around the suitable tooth on the upper and lower jaw and finally the wires of upper and lower jaw are twisted together.

Eyelet wiring for Intermaxillary fixation

The eyelets constructed by stainless steel wire are fitted between two teeth. The Intermaxillary fixation is completed by tie wires passed through the eyelets of the upper and lower jaw.

Arch bars for Intermaxillary fixation

Most commonly used Erich type arch bar has hooks to assist in Intermaxillary fixation. Required length of arch bar is cut, bent to adapt to the dental arch and fixed to the suitable shaped teeth by stainless steel wire. Finally the Intermaxillary fixation is completed with wires or elastic bands.

Intermaxillary fixation (IMF) is required for healing of mandibular fracture in pretraumatic occlusion after reduction. The IMF is usually maintained from 4 to 8 weeks till clinico-radiological union occurs except in cases of condylar fracture where early mobilization is desirable. IMF must be done in proper occlusion prior to rigid internal fixation by plates. The IMF may be released immediately or shortly after rigid fixation.

Dental Splints

Dental splints are useful when few teeth are available or when teeth themselves are loose. Dental splints are prepared from a reconstructed plaster of Paris model of the

patient's dentition. Various dental splints used for fixation are cap splint, occlusal splint, lingual splint and Gunning splint.

Metal cap splints are made for the entire dentition and fit accurately over the teeth. These are cemented in position to provide fixation. Occlusal splints are made of acrylic and placed on occlusal plane to keep dentition in correct occlusion. Lingual splints are placed along the lingual border of the mandible and held in place by circumdental wiring through the holes in the splint. Gunning splints are like full dentures without teeth and have application in edentulous patients. Gunning splints are circumferentially wired to maxilla and mandible.

Interosseous wiring

Interosseous wiring is used for fracture of the angle and body. Interosseous wiring is done with the teeth in occlusion. Wiring of upper border of mandible is done for edentulous posterior fragment via intraoral approach. Lower border wiring is done via skin incision below mandible except in symphyseal region where lower border wiring can be done via the anterior buccal sulcus incision.

Rigid Internal Fixation

Metal plate fixation and lag screw fixation needs increased operating time and greater expense. Both these techniques provide stable fixation and early mobilization and avoidance of IMF allows nutrition and oral hygiene.

8. ORBITO ZYGOMATIC FRACTURE

Symptoms: Diplopia, limitation of mandibular movement, facial contour defect.

Signs: Soft tissue swelling and bruising, flattening of malar prominence, step deformity at inferior and lateral orbital rim (due to separation of zygomaticomaxillary and frontozygomatic sutures). Infra orbital nerve anaesthesia (upper lip and upper teeth), enophthalmos (due to herniation of orbital contents following fracture of its floor/wall), diplopia (positive forced duction test due to incarceration of inferior rectus muscle in orbital floor fracture) and trismus (due to medially displaced arch fracture damaging temporalis muscle, displaced zygoma impinging upon coronoid process).

Radiological examination

- Waters view (occipitomental position) – for displacements at the inferior orbital and zygomaticomaxillary buttress, opacity of maxillary sinus and hanging drop sign
- Caldwell view (Posteroanterior projection) – for zygomaticofrontal suture
- Submentovertical projection – for zygomatic arches
- CT Scan (in axial and coronal plane) – for delineating expanded orbital volume and displacement of fracture segment.

Treatment

- Isolated arch fractures: isolated arch fractures are reduced via Gillies temporal approach. A 2 - 3 cm incision is made in the temporal hair line cutting skin, subcutaneous tissue, temporo-parietal fascia and temporalis fascia. The arch is elevated using Dingman elevator, which is inserted in the plane between temporalis fascia and temporalis muscle. Usually the reduced arch is stable.

Unstable arch fracture is approached by transcoronal incision and internal fixation is performed after reduction. Alternatively a long needle may be passed beneath the arch and left in place for 10 days to maintain the reduced position.

- Orbitozygomatic fractures

- a) Undisplaced fractures: Non displaced fractures are treated conservatively. Soft diet is advised and malar protection is ensured for 6 weeks especially during night. The patient is reexamined after one week to detect any displacement.
- b) Displaced fractures: Displaced fractures require open reduction and internal fixation for best results. Only reduction via intraoral approach is the best because in Gillies temporal approach or Dingman approach through lateral eye brow incision gives favorable results in less than 50% cases.

Internal fixation is performed at three sites – Zygomaticofrontal fracture site, inferior orbital rim fracture site and at zygomaticomaxillary buttress area. In presence of associated craniofacial fractures the exposure to these sites is achieved through the transcoronal incision, sub tarsal and intraoral incision. In isolated orbitozygomatic fracture these sites are approached via lateral upper lid blepharoplasty – type incision (zygomaticofrontal fracture site), Converse sub tarsal or infra-orbital rim incision (zygomaticomaxillary buttress area). The orbital floor should be routinely explored in high- velocity injuries, because the zygoma occupies the anterolateral position of the orbital floor. In Converse sub tarsal approach at least 4 mm of pretarsal orbicularis oculi muscle is left attached to the tarsal plate to avoid postoperative ectropion. The periosteum is incised inferior to the orbital rim to avoid injury to the orbital

septum.

As regards the sequence of fixation, zygomaticofrontal area is fixed first, followed by zygomaticomaxillary buttress and lastly, infraorbital rim area. Finally periosteum and soft tissue is closed in layers to avoid soft tissue contour deformity.

9. FRACTURES OF NASAL BONES

Patterns of injury

The pattern of nasal bone fracture depends on the site of impact and direction and intensity of force.

Frontal blows over the dorsum

With increasing severity it can produce the following injuries

- Fracture of thin lower half of the nasal bone.
- More severe blows may lead to fracture nasal bone with naso frontal suture separation.
- Nasoethmoido – orbital fracture

The displacement is antero posterior leading to saddling and broadening of the nose with gross buckling or actual fracture of the nasal septum.

Lateral blows

Following lateral blows in the majority of cases a fracture occurs between a thin lower half and thick upper half of the nasal bone. In younger patients fracture dislocation of larger

segment is seen but in older patients comminuted fractures are more common. Lateral blows of increasing intensity can produce following injuries:

- Fracture and medial displacement of only one nasal bone.
- Fracture and medial displacement of ipsilateral nasal bone and, fracture and lateral displacement of contralateral nasal bone.

Injury to nasal septum

Injury to nasal septum can occur with or without nasal bone fracture. The following type of injuries can occur to nasal septum.

- Septum fractures with or without telescoping type of displacement with overlapping of the fractured edges.
- Septum fracture with dislocation from vomerine groove (“C” shaped)
- Haematoma between septal mucoperichondrium and septal cartilage with or without fracture.

Diagnosis

- Physical examination
 - Nasal bone mobility, crepitus and tenderness on palpation is diagnostic feature.
 - Periorbital oedema, nasal oedema, deformity of nose and ecchymoses indicate nasal fracture.
- Radiological examination

X- rays are not absolutely necessary for diagnosis but provide a legal recording of the injury. Various radiological examinations required to demonstrate nasal bone fracture are :

- Lateral low density, soft tissue roentgenogram

- CT scan
- 30° to 45° occipitomental view may show bone fracture.

Management

- Simple nasal fractures : closed reduction with nasal packing and nasal splint
- Comminuted nasal fractures:
 - Open reduction and internal fixation through regional incisions or bicoronal and maxillary vestibular incision. Proximal bones are fixed with miniplates and screws. More distal nasal bones are fixed by interfragment wiring (fine wire 30 or 32) or by microplates.
 - Close reduction and fixation by through and through suture tied over two padded metal plates on either side of the nasal bones
 - Severe poly comminution and total proximal collapse may require cantilever bone graft fixed to the frontal bone with plates and screws through bicoronal incision.
- Closed reduction of nasal fractures

Simple of nasal bone fracture with minimal displacement and without significant septal deformity may be reduced successfully by simple thumb pressure from the side of laterally displaced nasal bone. Closed reduction can be done under general anaesthesia or with intranasal topical and external nasal field block. Packing with local anaesthetic agents with 1:100,000 epinephrine soaked pack produces vasoconstriction leadings to shrinkage of mucosal structures allowing an accurate intranasal examination.

The displaced nasal bones are mobilised with Asch or Walshams nasal forceps by upwards and outwards movements. The other hand is utilized to stabilize the head and to

palpate the proper reduction of the nasal bone fragments. Reduction of nasal bones facilitates the reduction of the septum. The septum is reduced by Asch septal forceps starting from the floor of the nose to the bony nasal pyramid. After this manoeuvre, fully mobilized nasal bones and septum should move freely on either side with digital pressure. Now the nasal bones are remolded inwards with digital pressure. A small amount of intranasal packing is done to support the nasal bones and septum. The external nasal splint of plaster of Paris or dental compound is applied.

The nasal pack is removed after 48 hours, but the nasal splint is continued for two weeks.

MAXILLA FRACTURE

Maxilla is attached to the base of the skull through zygoma laterally and nasoethmoidal structures medially. Maxilla has a body and four processes: frontal, zygomatic, palatine and alveolar. The sinuses are small in childhood and gradually grow to adult size later on in life. It resembles a hollow match box and cushions the effect of frontal impact force to the skull.

Classification of maxillary fractures

1. Alveolar fractures

Occur due to direct force or indirect force against the mandible.

2. Le Fort fractures

a) Le Fort I (Guerin) fractures: The fracture line extends posteriorly from the lateral margin of pyriform aperture, above the canine fossa, below the zygomatic buttress, along the

lateral antral wall and finally across the pterygomaxillary fissure to fracture the lower third of pterygoid plate. The fracture line also extends from the pyriform aperture along the lateral wall of the nose to join the lateral fracture line behind the tuberosity. The fracture may be unilateral or bilateral.

b) Le Fort II (Pyramidal or subzygomatic) fractures: Le Fort II fracture separates the pyramid shaped segment of maxilla from superior mid facial structures. The fracture line extends from the middle of the nasal bones, across the frontal process of maxilla, lacrimal bone, crossing inferior orbital margin near zygomaticomaxillary suture, then running beneath the zygomatic buttress across the pterygomaxillary fissure to fracture the pterygoid plate about half way up.

c) Le Fort III (Craniofacial dysjunction or suprazygomatic) fractures : The fracture line starting from the nasofrontal suture runs across thin orbital plate of ethmoid around the optic foramen and downwards laterally to the posterior limit of inferior orbital fissure. Then the fracture line extends posteriorly across the pterygomaxillary fissure to fracture the root of pterygoid plate. A fracture line also extends through the lateral wall of the orbit separating the zygomatic bone from the frontal bone.

d) Vertical or sagittal maxillary fractures : Vertical fracture occurs along the junction of the maxilla with the vomer and along zygomaticomaxillary suture.

Diagnosis

a) External examination : Inspection reveals oedema, ecchymosis, epistaxis and soft tissue lacerations. In the absence of oedema, elongation of face can be noticed. Palpation may reveal

step deformity at orbital rim, nasal bone fracture and tenderness over zygomatic arch.

b) Intra-oral examination : Intraoral inspection reveals gagging and derangement of occlusion. Lacerations, damage to alveolus and/or teeth may be present. Bony tenderness, irregularity, crepitus, and mobility of teeth and alveolus may be noted on palpation. Force applied by grasping the anterior portion of maxilla with thumb and index finger demonstrates movement at the nasal bone at the frontonasal suture in Le Fort II and Le Fort III fracture. The dentoalveolar segment moves independent of the remaining maxillary segment in Le Fort I fracture.

c) Radiological Examination :

1. Plain X-ray Skull-Waters, Caldwell, submentovertex and lateral views.
2. CT Scan – Fracture maxilla is best documented on axial CT Scans.

Management

a) Alveolar fractures : Fracture segment is digitally reduced and arch bar is applied. In some cases open reduction and plate and screw fixation/wire fixation are performed.

b) Le Fort and Sagittal fractures : Closed reduction using Rowe disimpaction forceps and Intermaxillary fixation to achieve satisfactory occlusion is done. Upper face is reduced by open reduction of fronto-zygomatic fracture site (lateral orbital rim) and at inferior orbital rim. At these two sites the fixation is achieved by interosseous wiring or plating. Finally, when plating is not done craniomaxillary or craniomandibular suspension is performed either by using suspension wire from infraorbital rim, zygomatic arches or from the site of fracture to zygomatic wiring or by halo frame. The period of fixation extends from four to eight weeks depending on the degree of comminution and age of the patient.

After application of Intermaxillary fixation, the incision is made for an open reduction

and internal fixation. Zygomatic arches, lateral orbital rim and nasoethmoid area are exposed by bicoronal flap. Inferior orbital rim and floor of orbit is exposed by sub tarsal incision or infraorbital rim incision. Intraoral molar-to-molar sublabial incision exposes maxilla up to inferior orbital rim. The nasomaxillary, zygomaticomaxillary and pterygo-maxillary buttresses are stabilized with plate and screws combined with primary autogenous bone graft (if required). The use of a plate and screw fixation technique may allow early or immediate mobilization.

For palatal split, direct exposure is performed at both palatal and alveolar ridge either through existing lacerations or mucoperiosteal incision. Plate and screw fixation is accomplished at these two sites. An acrylic palatal splint prevents palatal rotation.

PAN FACIAL FRACTURES

Pan facial fractures involve fractures of cranium, midface and mandible. The fixation of these injuries involves a co-ordinate repair of the frontal bar, zygomatic arches, central midface and mandible. Correct setting of facial width and projection must be achieved.

To achieve an outer facial frame with correct width the zygomatic arches and frontal bar are repaired first. The upper face is repaired within this frame from lateral to the medial side. Repair of upper portion of zygomaticomaxillary buttress, fixation of periorbital fractures with or without bone graft to orbital walls, repair of frontonasal buttress and correction of telescoped nose dorsum (primary bone graft if required) is achieved. Maxilla is now reduced to repair zygomaticomaxillary and nasomaxillary buttresses. Additional plating across the sagittal fractures anteriorly and at hard palate can be done. Bone deficits greater than 5-7mm are primarily grafted with split rib, iliac or calvarial bone. The mandible is now reduced over maxilla to achieve correct occlusal relationship. The anterior mandibular fractures are rigidly

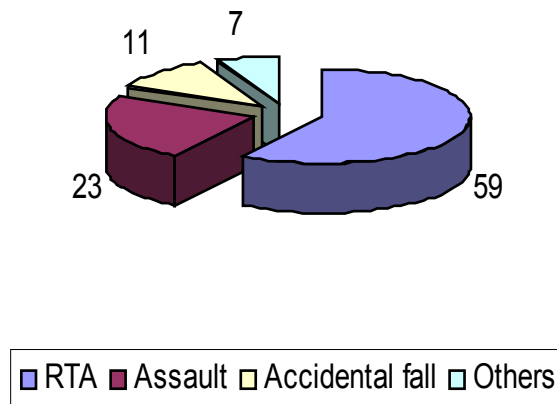
fixed. Open reduction and fixation of the condylar neck fractures is performed whenever possible.

OBSERVATION

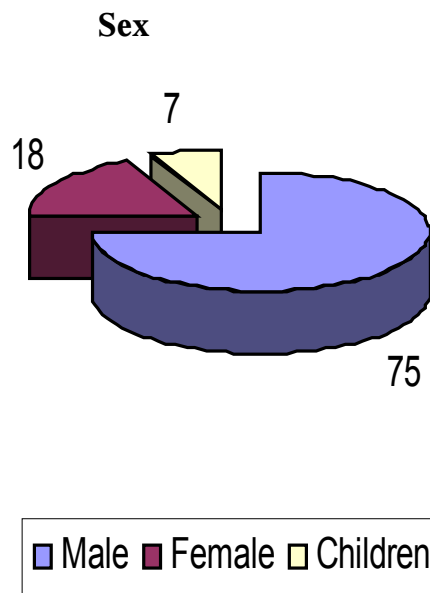
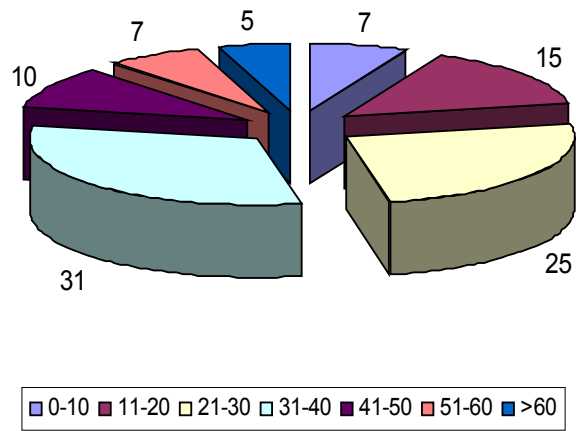
Adults >12 years were the 93% of the injured victims. Among them 75% are Males.

Age group between 20 and 40 was the major portion of the victims. Accidental injuries were common in old age. Among the mode of injury RTA and assaults were the major causes 82%. Other causes were Accidental fall, Human bite.

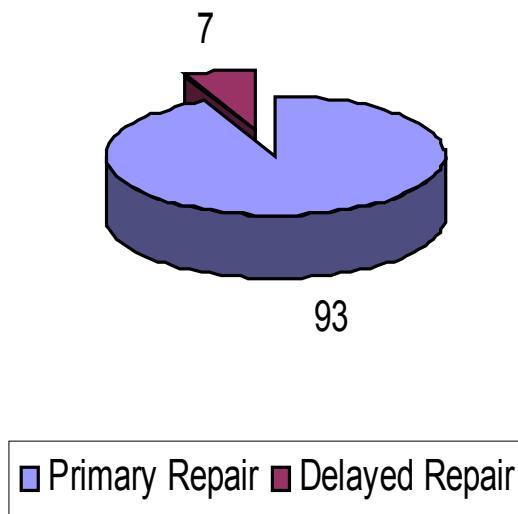
Mode of Injury



Age Incidence

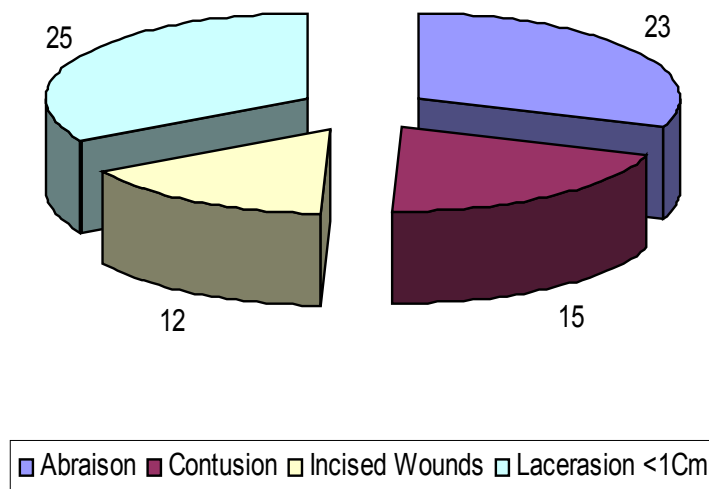


Types of Repair



SOFT TISSUE INJURY

Type of Injury



Contusion - Periorbital - 5

Nose - 3

Cheek - 2

Eyebrow - 2

Lip - 1

TMJ region - 1

Malar region - 1

Abrasions - Malar region – 8

Nose - 7

Cheek - 4

Fore head – 4

Small Lacerations (less than 1cm)

Eyebrow - 9

Infra orbital region - 4

Cheek - 3

Forehead - 3

Nose - 2

Chin - 2

Lower lip - 1

Temporal rapair - 1

Incised Wounds - 12

NOSE INJURY

- Total number of cases - 6
- Male - 5, Female - 1
- Nasal bone fracture – 4

Ala - 4

Tip - 2

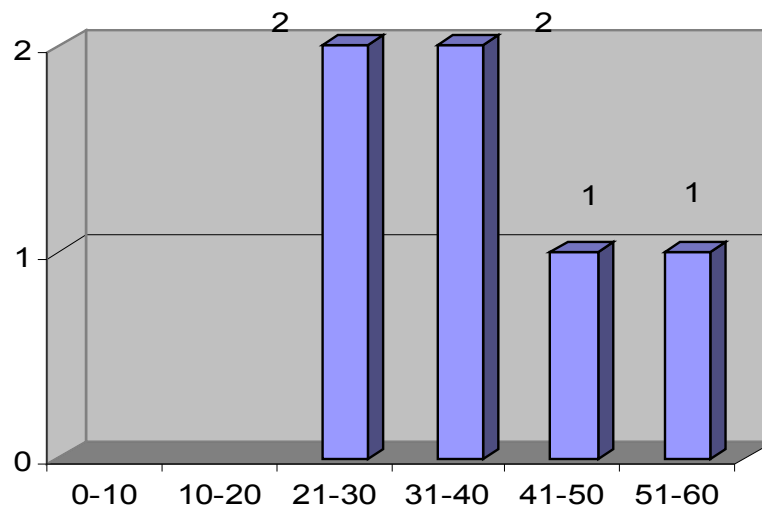
Septal injury - 1

Dorsum - 1

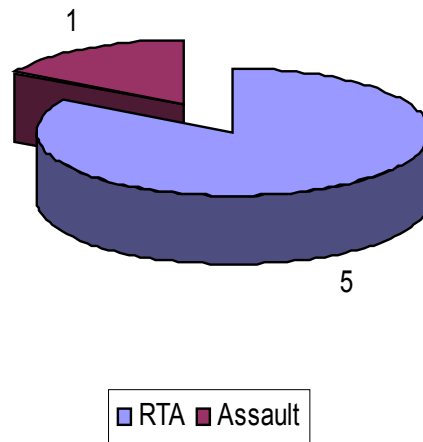
Columella - 1

- More than one aesthetic unit was injured in 4 cases
- RTA - 5 Assault - 1
- Associated with other injuries in 3 cases.

Nose - Age incidence



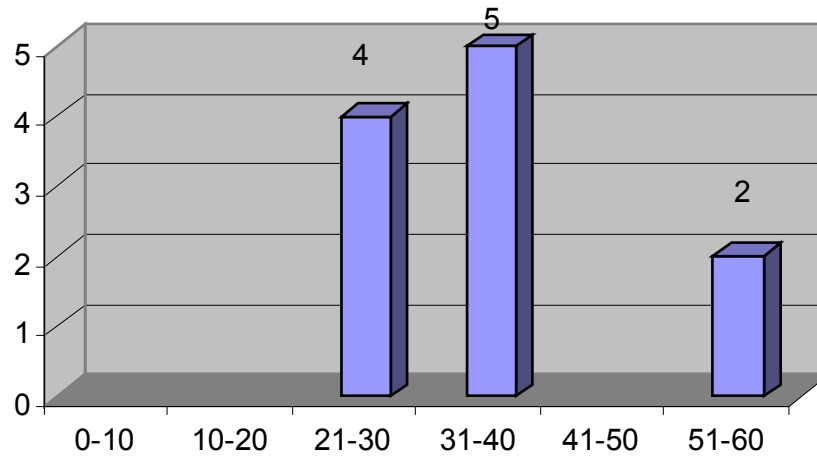
Nose - Mode ,



EYELID INJURY

- Total cases – 11
- Male - 10
- Female - 1
- RTA - 6
- Assault – 3
- Bullgore injury – 1
- Accidental fall - 1
- Right Eye – 6
- Left Eye – 4
- Both Eyes - 1
- Associated Lacrimal duct involvement - 1
- Other associated injuries - 6

Eyelid – Age Incidence

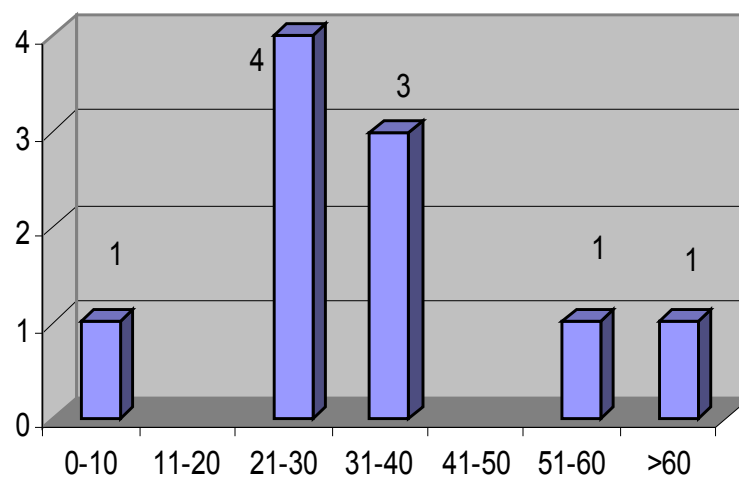


EAR INJURY

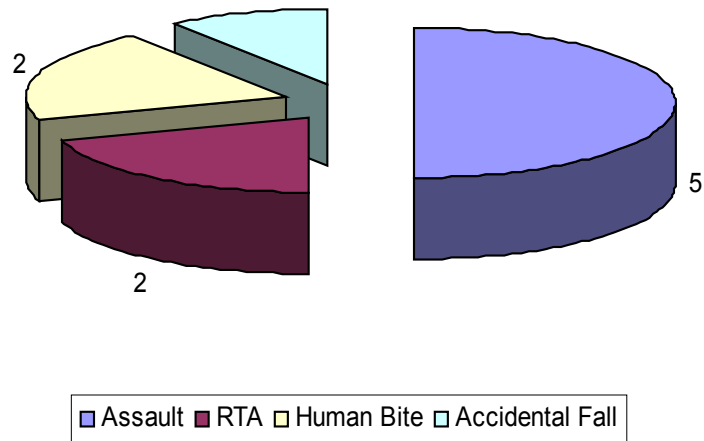
- Total - 10 cases
- Male – 8
- Female – 1
- Child - 1
- Assault – 5
- Human bite – 2
- RTA – 2
- Accidental fall - 1
- Upper 1/3 - 5
- Middle 1/3 - 2
- Lower 1/3 – 3
- Right – 6
- Left - 4
- Primary repair - 7

- Secondary reconstruction - 5
 - Converse tunneling - 3
- Dieffenbach advancement - 2

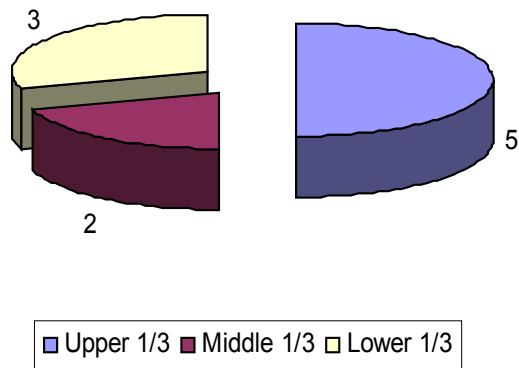
Ear Injury – Age Incidence



Ear – Mode of Injury



Ear - Region



LIP INJURY

- Total - 9
- Male - 5
Female - 4
- Upper lip alone - 3

Lower lip alone - 4

Both lips - 2

- RTA - 4

Assault - 3

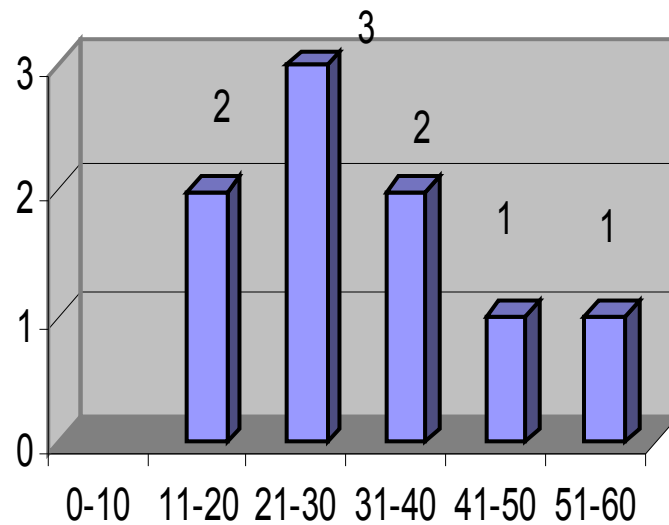
Rail track – 1

Human Bite - 1

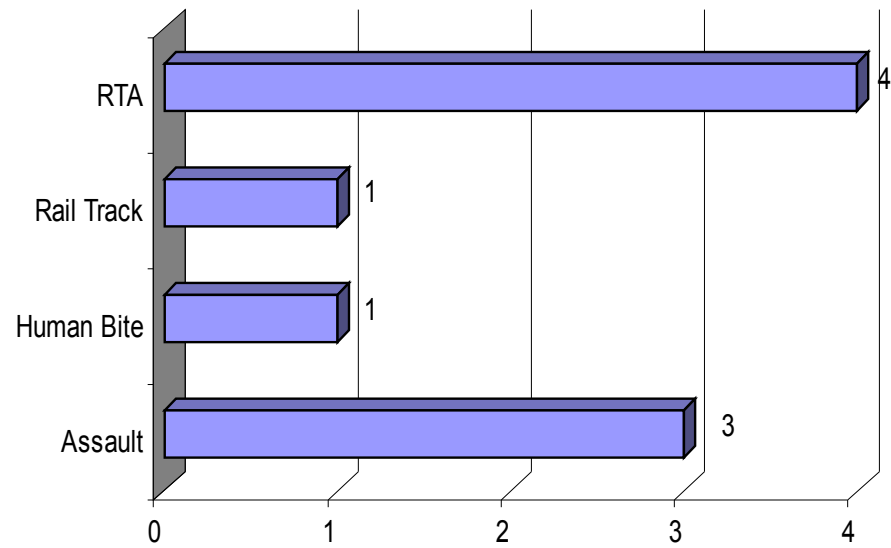
- Associated injuries - 6

All the cases were repaired primarily.

Lip Injury – Age incidence



Lip Injury - Mode



FACIAL NERVE INJURY

- Total – 4

- Male – 3

Female - 1

- Right – 2

Left - 2

- RTA – 3

Assault - 1

- Temporal branch - 1

Zygomatic branch - 3

Buccal branch - 2

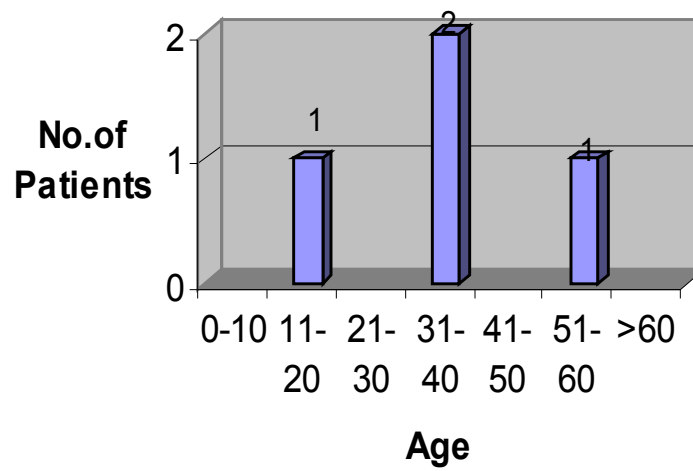
Cervical - 0

Mandibular - 0

Multiple branches - 2

Associated injuries – 4

Facial Nerve Injury – Age Incidence



ORAL CAVITY

Tongue injuries - 3

Dental injuries - 12

Palatal Haematoma - 2

Sublingual Haematoma - 3

Cheek Mucosa Laceration - 7

All injuries were repaired primarily.

ZYGOMA

- Total cases – 8

- Male – 6

Female - 2

- RTA – 8

- Right -5

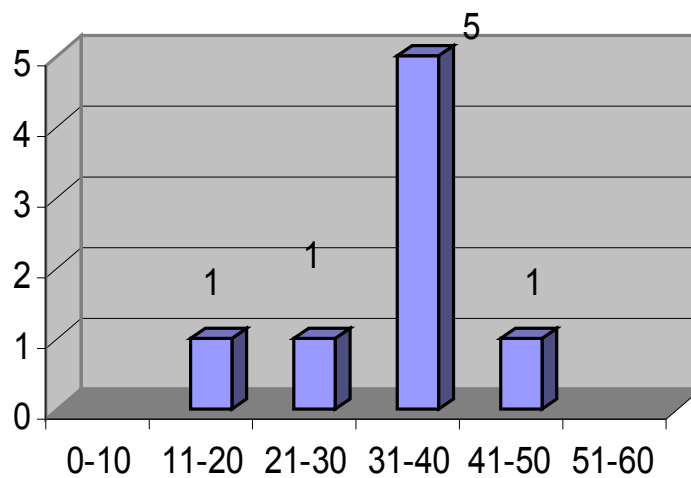
Left - 3

- Conservative Management – 2

ORIF -1

Closed reduction – 5

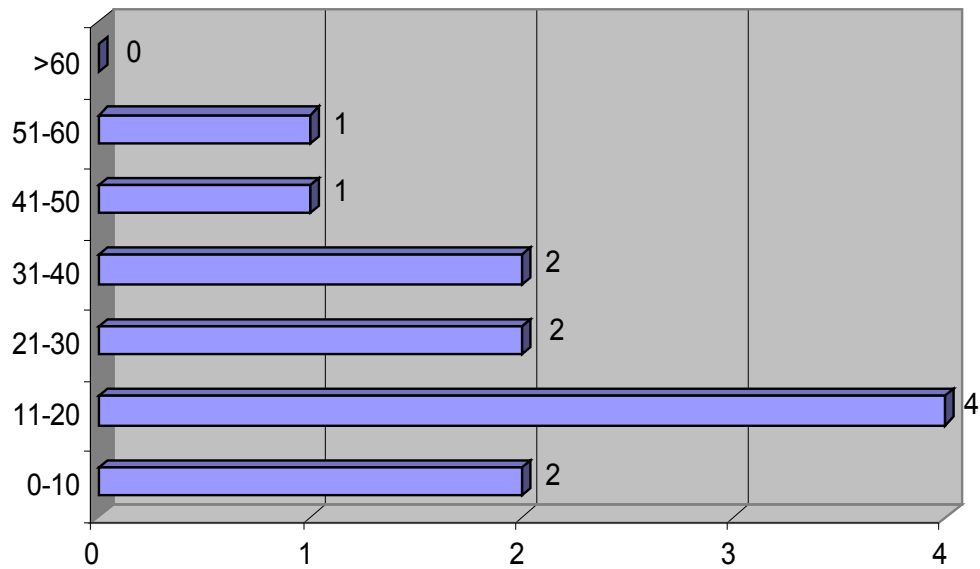
Zygoma Fracture - Age Incidence



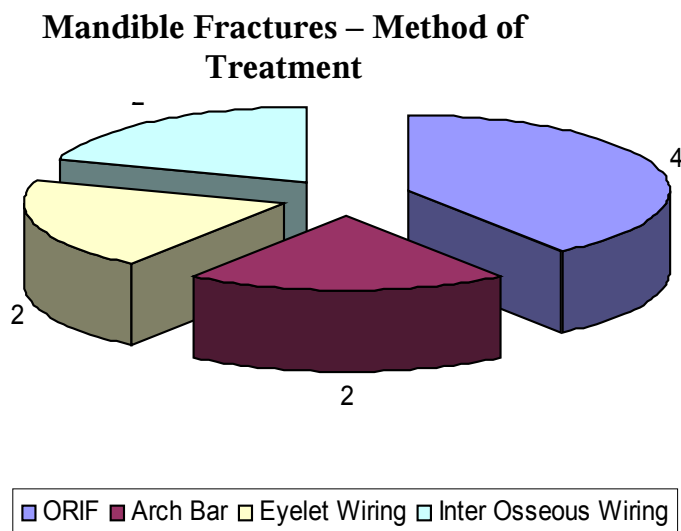
FRACTURE MANDIBLE

- Total number - 12
- Male – 8
- Female – 2
- Children - 2.
- Midline fracture – 1
- Condyle alone – 2
- Parasymphyseal with opposite condyle - 2
- Para symphyseal - 2
- Angle & Parasymphyseal - 2
- Multiple fractures - 2
- Angle alone - 1
- RTA – 9
- Assault -1
- Rail track injury – 1
- Accidental fall – 1

Mandible Fractures - Age incidence



ORIF done for 4 cases for whom fracture line runs in unfavorable direction. Two cases Ridson's incision made. Two cases intra oral incision made. Two mm stainless steel Plates - 4 hole with gap, 3 hole with gap and 2 mm screws were used. Plates were placed after IMF with normal occlusion. For one case intraoral was exposed, which was removed.



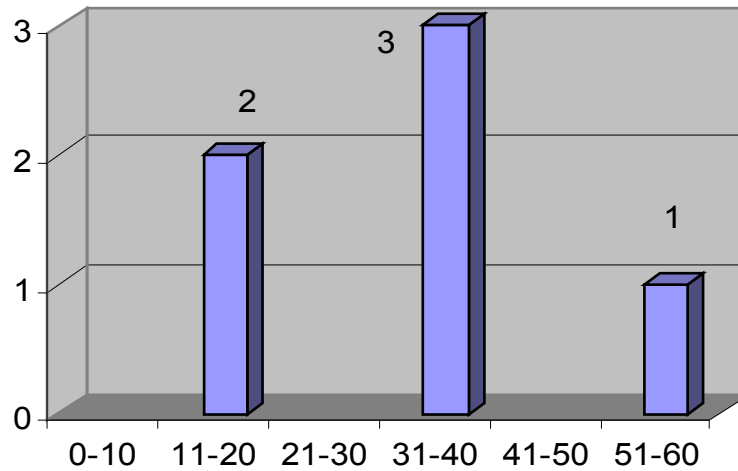
In all the cases IMF were removed after 6 weeks, except for Condyle fracture in which

IMF was removed after 4 weeks for early mobilization to avoid TMJ ankylosis. Oral hygiene, nutritional support were taken care.

MAXILLA FRACTURE

- Total - 6 cases
- Male – 5
- Female - 1
- RTA – 3
- Assault - 2.
- Bullgore – 1
- Anterior surface - 2
- Palatal surface - 2,
- Lefort I - 1
- II - 0
- III - 1

Maxilla Fractures – Age Incidence



OTHER INJURIES

Head injury - 3

Cardio thoracic injury - 7

Multiple rib fractures - 6

Stab injury - 1

SYSTEMATIC DISEASES

Diabetes mellitus - 5 cases

NIDDM - 5 cases

IDDM - 0

Juvenile Diabetes - 0

Hypertension - 7 cases

DISCUSSION

SOFT TISSUE

93 % of the cases had soft tissue injuries with or without bony injuries. Most of them were either abrasion or small laceration less than 1 cm.

The scars following these soft tissue injuries are having aesthetic significance. Female patients were reassured having considered about the psychological aspects of the scars over the face. Punctured wounds were very minimal. No parotid duct injury, TMJ injury in our study. 23% of patients had hyper pigmentation of the scar. Two patients had hypertrophic scar. Scar massaging, intra lesional locally acting steroid (triamcinolone) are being given. There is good improvement following 3 months.

NOSE

Nose injuries were treated with consideration of the aesthetic units. In this study all the 6 cases there was no tissue loss.

All the cases were treated primarily

One case of septal injury was reduced by Asch septal forceps starting from floor of the nose to the bony nasal pyramid.

Out of four cases of nasal bone fracture, two were reduced by thumb pressure from the side of locally displaced nasal bone. Two cases were reduced by Asch forceps after packing

with local anesthetic agent for 15 minutes.

Intra nasal packing was done for the cases of septal and nasal bone injury for 48 hours.

In four cases more than one cosmetic unit was involved.

For all the cases final functional and aesthetic results were excellent.

EYELID

Most of the eyelid injuries were due to RTA

In this study most of the cases had both eyelid injuries. Most of them had partial injuries only.

Three cases needed LPS repair. In the case of partial injury to the lacrimal duct, the duct was cannulated with 3/0 prolene and sutured under magnification. Associated injuries were zygoma fracture and head injuries.

On followup, two cases had mild notching of the lid margin. No functional deficits like diplopia or entropion or ectropion or epiphora. The necessity for dacryocystorhinostomy did not arise in this study. The cases are being followed up.

LIP

All the cases were repaired primarily. Since all the cases were lacerations and there was no significant tissue loss, no necessity for any flap.

The results were cosmetically and functionally good.

EAR

Out of 10 cases seven cases repaired primarily. Three cases were referred after 72 hours with infection. So the wound was allowed to heal and planned for delayed, staged reconstruction after 6 months.

Out of the primarily repaired cases for 3 cases converse tunneling was done and staged reconstruction done. For two cases Dieffenbach advancement was done.

All the cases are being followed up regularly.

FACIAL NERVE

Out of the four cases three cases were due to RTA. One case was due to assault (incised wound). In one case the injury was Lateral to mid pupillary line under magnification the temporal and the zygomatic branches were sutured with 8/0 prolene. Short course of steroid was given.

Post operative recovery was good. The injuries medial to the mid pupillary line were managed conservatively. The cases are being followed up.

ORAL CAVITY

There were 27 cases of with intra oral lesions.

Most of them were dental lesions (like tooth loss, partial injury to the root, subluxation and fracture) cheek mucosa and tongue laceration.

All of them were primarily treated.

ZYGOMA

All the eight cases were due to RTA. In two cases there were no displacement of the segment or functional deficit. They were managed conservatively.

In five cases, there were incomplete fractures of the Zygomatico frontal buttress. So closed reduction by Gillie's approach was possible. Rowe's elevator was used.

Soft diet and malar protection were advised for 6 weeks. Patients were reviewed once in a week to detect any displacement.

One case with complete fracture of zygomatico frontal buttress with displacement ORIF was done. Lateral upper eyelid incision was made and internal fixation by 2mm SS plate and screws. Post Operative results were good.

MANDIBLE

RTA was the major cause for fracture in our study. Most of the cases there were more than one fracture and associated with other injuries probably because of high momentum of the impact at the time of accident.

66% of cases were managed conservatively under inferior alveolar nerve block and other local nerve blocks. Various methods were tried with arch bar, interdental wiring, eyelet wiring and interosseus wiring. All of them had durable fixation and able to maintain the occlusion.

2 of the cases had minimal open bite after 6 weeks for whom the rubber bands were applied for additional 2 weeks with IMF.

ORIF was done for 34% of cases those who had multiple fractures and for whom the IMF alone were not effective to maintain normocclusion. We used 2 mm SS plates under with screws. Two plates were fixed over each fracture site except condyle.

MAXILLA

Anterior surface, Palatal surface fractures without displacement were treated with IMF for 6 weeks. LeFort 1 fracture was treated with IMF & Adams suspension

LeFort III was treated by ORIF.

In all the 6 cases post operative occlusion was satisfactory. No significant complication was noted.

OTHER INJURIES

Three of our cases had significant head injury and were treated by Neurosurgeons – two patients died

Four cases had multiple rib fractures with haemopneumothorax, which were treated by cardiothoracic surgeons. One patient died. One of our patient needed ventilatory support temporarily.

CONCLUSION

In our study soft tissues are the most common injuries. Men are the most commonly injured. Age group of 20-40 are the most affected. Primary reconstruction gives the best aesthetic and functional results. Even in bony injuries timely primary repair (Reduction of fractures with IMF) avoids unnecessary deformities like malunion, malocclusion and disfigurement requiring future major procedures like osteotomies. Sometimes it may be even difficult to restore normal anatomy with osteotomies in secondary repair.

Primary reconstruction of the soft tissues should be done at all situations. In our study cosmetic and functional results of such primary repair proves the same. Even in situations like head injuries, facial soft tissues were repaired primarily to avoid infective loss of soft tissues, future scar formation and its consequences in the face.

Systemic diseases like diabetes mellitus, headinjury patients with steroids adversely influence wound healing. To prevent such faciomaxillary injuries due to RTA, the following should be considered.

- Public should be educated about road safety measure's important.
- Traffic rules should be strictly implemented and followed.

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DEPARTMENT OF PLASTIC AND RECONSTRUCTIVE SURGERY

**GOVERNMENT RAJAJI HOSPITAL AND MADURAI MEDICAL COLLEGE,
MADURAI.**

ANALYSIS OF HUNDRED CASES OF FACIOMAXILLARY INJURIES

Year : 2003- 2006

Name : Age : Sex : I.P.No :

Address :

Date of admission :

Injuries : Soft tissue / bone / Both

Mode of injury: Assault / RTA / Accidental / Others

Soft tissue : Aesthetic units

Eyelid : Right / Left Upper / Lower Eye ball Lacrimal apparatus

Ear : Right / Left Upper 1/3 Middle 1/3 Lower 1/3

Nose : Dorsum Ala Columella Septum

Lip : Upper / Lower

Cheeks : Mucosa / Tongue / Teeth / Palate / Haematoma

Bony Injuries : Mandible / Maxilla / Zygoma / Nasal Bone / Nasoethmoido orbital
complex / Frontal bone.

Associated Injuries :

Associated systemic disease : Diabetes / Steroids in Head injury / Others.

Treatment Given :

Follow Up :